Department of Environmental Protection
Bureau of Land & Water Quality May, 2002

O&M Newsletter

A monthly newsletter for wastewater discharge licensees, treatment facility operators and associated persons

Energy Conservation in Wastewater Treatment Facilities

In this issue of the *O&M News*, we continue our series of articles on Energy Conservation with some thoughts about variable frequency drives (VFDs). This article is reprinted from a report titled "Saving Money and the Environment Through Energy Savings". The report was the result of a joint effort between staff from the Region 1 EPA Office in Boston, several of the New England States, several New England Utilities, several consultants and vendors in doing business in the energy field and the New England Interstate Water Pollution Control Commission.

Variable Frequency Drives

A variable frequency drive (VFD) is an electronic controller that adjusts the speed of an electric motor. Most industrial AC (alternating current) induction motors manufactured in the US are designed to operate with a current that alternates in the direction of flow 60 times per second (HZ). If this frequency of alternation is changed, the speed of the motor changes. By controlling the AC frequency and voltage with a variable frequency drive, you control motor speed. Therefore, VFDs can provide continuous control, matching motor speed to the specific demands of the work being performed.

Standard motor starters start motors abruptly, subjecting the motor to high torque and current surges up to 10 times the full load current. In contrast, VFDs offer a "soft start" capability, gradually ramping up a motor to operating speed. This lessens mechanical and electrical stress on the motor system, reduces maintenance and repair costs, and extends motor life.

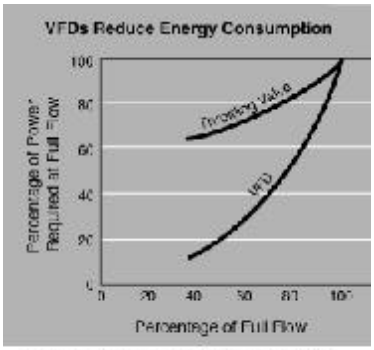

Figure 1. Energy consumption of VFDs and throttling valves.

VFDs are increasing in popularity at wastewater facilities where the greatest energy use is from pumping and aeration- two applications particularly suited to VFDs. For applications where flow requirements vary, mechanical devices such as flow-restricting valves or moveable air vanes are often used to control flow. This is akin to driving a car at full throttle while using the brake to control speed. This process uses excessive energy and may create punishing conditions for the mechanical equipment involved. VFDs enable pumps to accommodate

fluctuating demand, running pumps at lower speeds and drawing less energy while still meeting pumping needs. Figure 1 illustrates the reduced energy consumption of VFDs over valve control systems. With VFDs, wastewater treatment plants can more consistently maintain desired dissolved oxygen (DO) concentrations over a wide range of flow and biological loading conditions by using automated controls to link DO sensors to VFDs on the aeration blowers.

Energy savings from VFDs can be significant. Even a small reduction in motor speed will significantly increase your energy savings. For example, a 20% reduction in motor speed can reduce the energy requirements by nearly 50%. Therefore, a pump motor that does not usually need to run at full speed can substantially reduce its energy use by using a VFD. For example, a 25_hp motor running 23 hours per day (2 hours at 100% speed; 8 hours at 75%; 8 hours at 67%; and 5 hours at 50%) can reduce energy use by 45% using a VFD. At $0.10 kWh, this saves $5,374 annually. VFDs work with most three-phase electric motors, so existing pumps and blowers that use throttling devices can be retrofit with these controls. VFDs can also be specified for new equipment. Initial costs for VFDs can seem expensive, but payback periods for these drives can range from just a few months to less than three years for 25 to 250 hp models. In addition, savings from reduced maintenance and longer equipment life contribute significantly to achieving a rapid payback and long-term savings. Also, many electric utilities offer financial incentives that can reduce the installed costs of VFDs.

VFDs are not suited to all applications, such as flow that is relatively constant. Therefore it is important to calculate the benefits for each application based on the system variables such as pump size, variability of flow, and total head. As mentioned, it is prudent to first perform a pumping system assessment to determine if flow and energy requirements in the pumping system can be reduced before making other energy improvements.

You can obtain a report containing further tips on improvements to each of these areas by contacting Dick Darling at the DEP.

Electronic Copies of the O&M news

We're up to about 100 operators and others interested individuals who have signed up to get the O&M News via e-mail. You can fin it on the DEP Web site at http://www.state.me.us/dep/blwq/newslet/omnews.pdf, but e-mail is a quicker way to get the news in your hands. (And we promise not to throw it in the bushes.)
If you have e-mail and would like to receive the O&M News electronically instead of in the mail, please send an e-mail to:

dick.darling@state.me.us

We will add your e-mail address to our e-mail group and start sending your O&M News electronically.

For Practice

1. If the supernatant from an aerobic digester has a high solids content, how will it most likely affect the activated sludge aeration basin?

a. Increase the DO level.
b. Increase the MCRT.
c. Increase the F/M ratio.
d. Increase the removal efficiency.

2. The concentration of dissolved oxygen that may be held in water

a. Increases as temperature increased
b. Decreases as temperature decreases
c. Is independent of temperature
d. Increases as temperature decreases

3. The type of solids that is the easiest to remove using a standard biological treatment process is.

a. Inorganic suspended
b. Inorganic dissolved
c. Organic suspended
d. Organic dissolved

4. The best description of activated sludge that has an MCRT of more than 20 days is:

a. Young, poor settling, underoxidized
b. Young, good settling, clear effluent
c. Old, rapid settling, overoxidized
d. Old, poor settling, underoxidized

Spring 2002 Exam

Those of you who signed up to take the Spring wastewater operator exam should have received your conformation letters by now. If you haven't received your confirmatiom, please contact us A.S.A.P. The Fall exam will be given on November 13, 2002 at the usual locations.

License/permit conditions & compliance

The fundamental reason for both Maine's Waste Discharge Licensing/Permitting Program and the federal NPDES permitting program is to control, reduce or eliminate discharges of pollutants to waters of the state and nation. To accomplish pollutant control, reduction or elimination, license/permit applications are evaluated against standards for treatment and the size and sensitivity of the receiving water.

The result of these evaluations is that every Maine Waste Discharge License or Maine Pollutant Discharge Elimination System permit includes a list of conditions that apply to the discharge of the effluent. The conditions fall into two distinct categories: special conditions that address the limits, reporting or restrictions particular to each license, and standard conditions that describe limits, activities and reporting that apply to all licensees in the regulated community.

Special conditions may include the numerical effluent limits and monitoring requirements, narrative limitations, toxicity testing and reporting requirements, CSO control/reporting requirements, septage receipt restrictions, pretreatment requirements, and any other facility-specific studies or reports. Most licenses present the numerical effluent limits in table format, with extensive footnotes providing additional detail. Some licenses contain several pages of numerical effluent limit tables. Narrative limitations describe the sampling, monitoring and reporting for aspects of the discharge that cannot be conveniently expressed in table format.

The special conditions following the effluent limits and narrative limitations often include additional monitoring and reporting requirements. Depending on the type and size of a facility, the permit or license may include many or few special conditions.

Standard conditions include general reporting instructions or requirements, reporting of spills or bypasses, non-compliance notification requirements, right of the DEP to enter and inspect, representative sampling requirements, duty to comply with the license, requirement to maintain records, etc.

Nearly all operators pay close attention to the numerical effluent limits, especially when these limits are presented in table format. Because of the focus on the numerical effluent limits, the other special and standard conditions sometimes are forgotten or ignored. It is very important to review, understand and comply with all of the special and standard conditions. These conditions are included in, or attached to, discharge licenses or permits because they are important to achieve the best operation of the facility, treatment of pollutants, describe particular aspects or effects of the discharge, or meet legal requirements. Failure to comply with any of the conditions of a license or permit could be grounds for Letters of Warning, Notices of Violation or formal enforcement action. In future articles, we will review in detail some special conditions and all of the standard conditions.

If you have not reviewed your discharge permit lately it is a good idea to reread it in its entirety to ensure you are in compliance with all of the permit conditions.

UPCOMING TRAINING COURSES

May 30, 2002 in Presque Isle, ME – Stormwater II - sponsored by MRWA, (207) 729-6569 - Approved for 4 hours.
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June 3 & 4, 2002 in Augusta, ME – Identification of Filamentous Organisms in Activated Sludge – Sponsored by JETCC/NEIWPCC, (207) 767-2649 – Approved for 12 hours.
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June 2-5 in Rockport, Maine – NEWEA Annual Spring Meeting – Sponsored by NEWEA (781) 939-0907 – approved for up to 12 hours.
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June 13,2002 – Veazie Sewer District, Veazie, Maine – Introducing Complete-Mix to an existing Lagoon System – Sponsored by MRWA (207) 729-6569 – approved for 5 credit hours.
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July 16, 2001 - Emergency Response Planning for Your Business – Verrillo's Convention Center, 155 Riverside St. Portland, ME. To enroll call 1-800-873-7545 or on-line at www.skillpath.com

2002 Operator Certification Renewals

Renewal letters and pocket cards have been sent to all operators who submitted renewal forms and whose training has been verified. Some operators who did not meet the 18 hour training requirement by March 1 will not receive their renewal notice until we can verify that their training has been completed.

Any operators who did not submitted their renewal forms have been placed on inactive status. They will be required to submit a reactivation form and $30.00 reactivation fee before March 1, 2004 to reinstate their license.
Anyone whose license has been inactive for more than two years as of March 1, 2002 has been dropped from our lists and will be required to reapply and pass the exam in order to regain their license.

Dick Darling

Answers to *For Practice:*

1. c Any solids coming from the aerobic digester will be seen as food for the microorganisms in the mixed liquor. This will increase the F:M ratio.
2. d Cold water will hold more dissolved oxygen than warmer water.
3. d Dissolved organic solids are easily absorbed by the microorganisms in a biological treatment system.
4. c Sludge with and MCRT of more than 20 days will usually show old, compact, highly oxidized flocs that settle rapidly leaving a turbid supernatant.

EPA DMR QA Study #22 Update.

According to the EPA, the announcement letter for Study #22 which will inform participants of the QA sample ordering dates and about the other milestones involved in this study will start to be mailed out by the middle of May. If you are a past participant in these studies and do not receive this letter by May 28, please call me at 287-7659.

David Dodge